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RESEARCH ARTICLE

Prevalence Of Caffeine Consumption Among Medical Students: Commute - Related Functional Use And The Disconnect Between Consumption And Perceived Cognitive Benefit.

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Abstract: ***Background***: Medical students face high academic stress and, in urban South Asia, lengthy commutes. This cross-sectional study determined caffeine prevalence, consumption patterns, motivations, and perceptions among medical students at Pak Red Crescent Medical and Dental College (PRCMDC), Lahore, with specific attention to commuter-related functional use.***Results***: A structured questionnaire was administered to 232 undergraduate medical students (July--September 2025). Descriptive statistics and chi-square tests assessed mainly consumption by source, quantity, and timing, as well as associations with demographics. Valid responses (N=231) were predominantly male (60.2%) and aged ≤23 years (83.5%). High prevalence was observed for tea (183 students, 79.2%) and chocolate (167 students, 72.3%). Most students (75.9%) used caffeine during examinations. Notably, the primary reason cited was driving commuting (62.8%), surpassing studying (22.9%). Consumption was generally moderate (59.7% consumed one cup per sitting). A disconnect emerged between use and perceived benefit: 61.2% did not believe caffeine improved reading ability, and 72.0% believed it could harm health, although use continued unabated.***Conclusion:*** Caffeine use among these medical students is functionally driven - primarily to maintain alertness and meet academic demands - rather than by belief in cognitive enhancement. Despite health awareness, immediate alertness needs override long-term risk concerns. Institutional wellness programs should address non-pharmacological fatigue management, specifically for students facing lengthy commutes.

Keywords: Caffeine consumption; Medical students; Prevalence; Driving; Commute-related functional use; Academic stress; Health perception; Fatigue management; Functional use; South Asia..

INTRODUCTION

Caffeine is the most widely consumed psychoactive substance in the world, as a powerful stimulant of the central nervous system in the methylxanthine class [1]. Caffeine is most commonly found in the seeds, nuts, or leaves of various plants native to Africa, East Asia, South Asia, and the Americas. The Food and Drug Administration (FDA) states that caffeine is generally recognized as safe (GRAS) [2]. Although it enhances physical, mental, and social health when consumed in small amounts [3], caffeine does so when consumed in small amounts. It also improves overall well-being. However, any caffeine consumption that exceeds 250 mg can lead to caffeine intoxication, as a result of excessive caffeine intake. Some symptoms of caffeine intoxication, such as fidgeting, excitement, insomnia, increased urination, gastrointestinal disturbance, muscle twitching, irregular or rapid heartbeat, and psychomotor agitation, are unveiled by the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5) [4].

Most medical students use caffeine to stay awake, agile, and alert. It also maintains a higher level of concentration while studying. The side effects of caffeine, like headache, palpitations, anxiety, and insomnia, are sometimes not even considered by college students due to a lack of knowledge or even because of the momentary better ergogenic effects of caffeine [5].

Around 75.5% of university students in Pakistan have been reported to consume caffeine [6]. In Bahrain, the mean daily caffeine consumption among college students was estimated, with females consuming less than males (246 and 306 mg/day, respectively) [7]. In the UAE, however, the prevalence of caffeine consumption was as high as 90.1% [8]. Moreover, medical students have been reported to be 97% low-category caffeine consumers and 3% moderate-category consumers, although caffeine consumption was higher on exam days [9]. Due to the extensive curriculum and multiple syllabi in each professional year, medical students are at risk of

consuming excessive amounts of caffeine to keep up with the continuous study hours required. Exposure to weekly academic evaluations, including internal assessments and university examinations, results in stress for medical students. In a survey of first- and second-year medical students, 49% reported that caffeinated products were their preferred way to manage academic stress [10].

The issue of commuter-related caffeine use in medical students is a hidden and relatively new aspect of stimulant use patterns. Daily school commuting is a major issue in South Asian urban contexts. It is a fact that such colleges are generally far from students' residences. It is worth remembering that, according to the National Center for Chronic Disease Prevention and Health Promotion, drowsy-driving accidents often result from lack of sleep and the pressures of the daily commute [11]. Basner et al. have revealed that impaired sleep-related attention among commercial drivers substantially increases road safety risks [12]. These existing studies in the occupational health literature demonstrate that using caffeine to stay awake during commuting hours may be a necessary functional behavior. However, it can also lead to a problematic pattern of functional reliance. This research is conducted to assess the frequency of caffeine consumption and students' perceptions of caffeine's effects at PRCMDC. The study specifically highlights driving/commuting as the primary reason for caffeine consumption.

MATERIALS AND METHODS

Study Design

This was a descriptive cross-sectional study to assess the prevalence of caffeine consumption among medical students at the Pak Red Crescent Medical College, Lahore.

Study Setting and Duration

A structured student survey was carried out at Pak Red Crescent Medical College in Lahore. The survey spanned over three months, from July 1 to September 30 in 2025. Data collection occurred over three months to accommodate academic schedules.

Study Population

The study population comprised undergraduate medical students in the MBBS program. All students encompass the first to the final years at Pak Red Crescent Medical College.

Sample Size

Convenience sampling was used to select a group of 232 students. In addition to the total student population, other factors considered in determining the sample size were participant availability and time constraints.

Sampling Technique

A nonprobability convenience sampling technique was employed. Students who agreed and were available during the data collection period were included.

Inclusion Criteria

Currently pursuing an MBBS at Pak Red Crescent Medical College. All are willing students to participate in the study. Age range of 18-30 years.

Exclusion Criteria

Students who were on leave or not physically present for the study. All those students who suffer from psychiatric or medical conditions and are on prescribed stimulant medication. All students who are unwilling to participate in the study.

Data Collection Tool

A structured, self-administered questionnaire was the data-collecting instrument. It comprised the following parts:

- Demographic representations (age, gender, and the year of study)
- Caffeine consumption patterns (type of caffeine consumed, frequency per day/week, reason/motive for consumption, the time of day, etc.)
- Awareness about the impacts and the underlying caffeine threats.

The tool was developed through an extensive review of the relevant literature, and the latest version was tested with 10 students to identify any misunderstandings or errors (pilot study). The questionnaire was based on previously published questionnaires on caffeine consumption among medical students [6, 8, 9]. The authors of the original work permitted the use of their instruments, which were adapted to suit the local situation. Face validity of the questionnaire was established through an expert review by faculty members from the Department of Community Medicine.

The full questionnaire is provided in Supplementary File 1.

Data Collection Procedure

After receiving the ethical clearance from the Institutional Review Board (IRB), the students were contacted. Sometimes during lecture breaks or clinical rotation periods. The study objectives were explained to them, and written informed consent was obtained. Questionnaires were filled out by students online through a digital format (Google Forms).

Data Analysis

The researchers employed SPSS version 26 to analyze the data. The researchers used descriptive statistics to extrapolate the results. It included frequencies and percentages, means, and standard deviations. The primary purpose was to describe the data. The study used chi-square tests to explore associations between various

categorical variables. These comprised gender, caffeine use, academic year, and consumption patterns. Any p-value below 0.05 is statistically thought significant and, accordingly, evaluated. The test statistics table discloses the chi-square values, degrees of freedom for context, and their associated p-values for interpreting significance.

Ethical Considerations

- The Ethical Review Board of Pak Red Crescent Medical College bestowed the ethical approval.
- Participation of the students was not mandatory. All gathered information was kept anonymous and confidential.
- The researchers collected data without using personal identifiers. It was used solely for academic and research purposes.

RESULTS

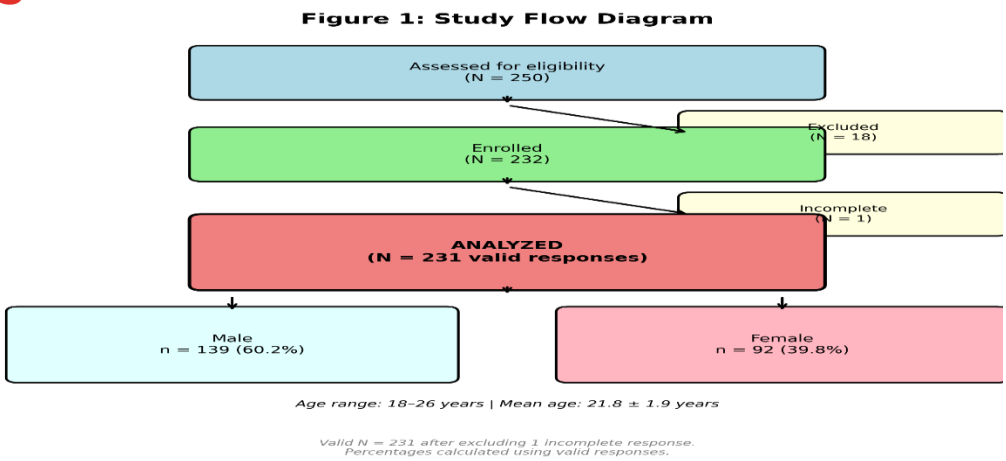

Figure 1: Study Flow Diagram

Figure 1: Study Flow Diagram

The study used a CONSORT-style flow diagram to exhibit its recruitment and sampling processes. The study findings show 250 distributed surveys. The total number of responses received was 232, with 231 valid after excluding 1 incomplete response from analysis. Valid N=231 after excluding 1 incomplete response. Percentages calculated using valid responses unless otherwise noted.

The demographic data show 139 participants identified as male. It represents 60.2% of the total. The females identified were 92. It accounts for 39.8%. The population age distribution ranges from 18 to 26 years. The central tendency was 21.5 years, along with a spread of 1.8 years above and below this value. The figure illustrates the participant selection process researchers used to determine the minimum sample size for subsequent analyses.

Table 1: Age Distribution of Study Participants (N=231).

Age (Years)	Frequency (n)	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
18	10	4.3	4.3	4.3
19	19	8.2	8.2	12.5
20	39	16.8	16.9	29.4
21	38	16.4	16.5	45.9
22	41	17.7	17.7	63.6
23	46	19.8	19.9	83.5
24	27	11.6	11.7	95.2
25	10	4.3	4.3	99.6
26	1	0.4	0.4	100
Total	231	99.6	100.0	
Missing	1	0.4		
Overall Total	232	100.0		

Data presented as frequency (n) and percentage (%). Missing data: 1 response. Age range: 18–26 years. Mean age: 21.8±1.9 years. The sample analysis comprised 231 valid cases, following the exclusion of 1 incomplete response. Percentages reported are based exclusively on valid entries unless otherwise indicated.

The sample consists of more than 95% young adults. The data is based on 231 of 232 respondents. The group shows a pronounced age concentration. More than 70% of its members are in the 20-23 age range. The distribution peaks at age 23. This accounts for almost 20% of the total respondents. The data show a rightward distribution. The number of 18-to 23-year-olds increased sharply before dropping to a low level. Except for a few people reaching 25 years old. The cumulative percentage indicates that 83.5% of the sample was 23 years or younger. The pattern indicates that the study results are drawn from a university undergraduate population. The findings are primarily generalizable to young people.

Figure 2: Demographic Characteristics of Study Participants (N=231)

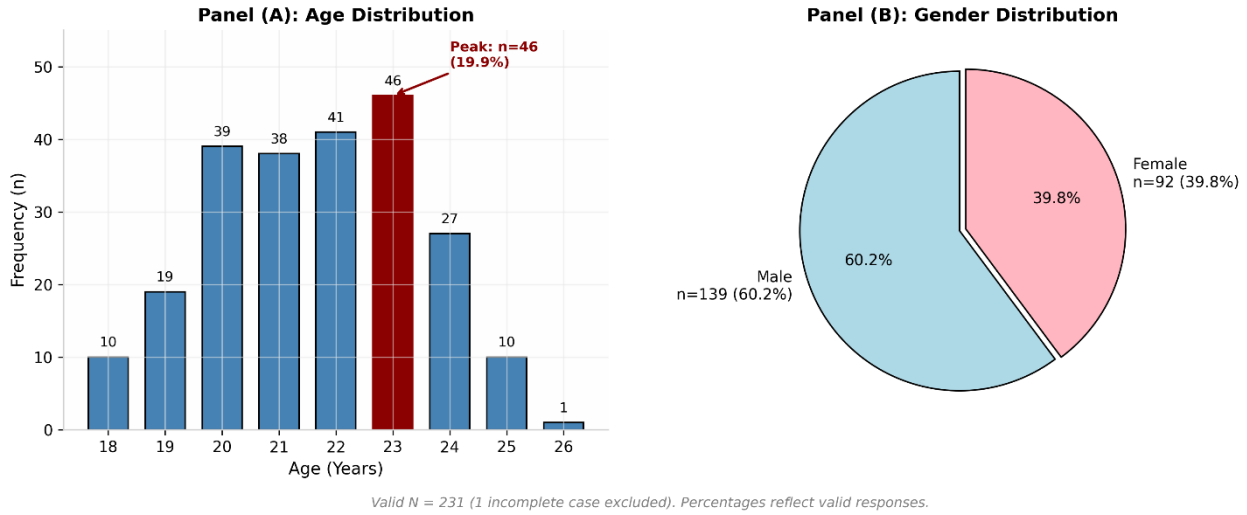

Figure 2: Demographic Characteristics of Study Participants. Panel (A) shows the age distribution histogram, with a peak at age 23 (n=46), and the cohort is heavily concentrated between ages 20 and 23. Panel (B) illustrates gender proportions among respondents (Male 60.2% vs. Female 39.8%, N=231). Valid N = 231 (1 incomplete case excluded). Percentages reflect valid responses unless specified otherwise.

Table 2: Caffeine Consumption Habits and Perceptions by Academic Year (Valid N = 231)

Question	Response	1st Year	2nd Year	3rd Year	4th Year	Final Year	Total n (%)
Do you consume coffee?	Yes	17 (7.4%)	20 (8.7%)	40 (17.3%)	6 (2.6%)	20 (8.7%)	103 (44.6 %)
	No	23 (10.0%)	37 (16.0%)	32 (13.9%)	17 (7.4%)	19 (8.2%)	128 (55.4 %)
Do you consume tea?	Yes	32 (13.9%)	43 (18.6%)	60 (26.0%)	18 (7.8%)	30 (13.0%)	183 (79.2 %)
	No	8 (3.5%)	14 (6.1%)	12 (5.2%)	5 (2.2%)	9 (3.9%)	48 (20.8%)
Do you consume soft drinks?	Yes	18 (7.8%)	22 (9.5%)	22 (9.5%)	12 (5.2%)	15 (6.5%)	89 (38.5%)
	No	22 (9.5%)	35 (15.2%)	50 (21.6%)	11 (4.8%)	24 (10.4%)	142 (61.5 %)
Do you consume energy drinks?	Yes	17 (7.4%)	20 (8.7%)	40 (17.3%)	6 (2.6%)	20 (8.7%)	103 (44.6 %)
	No	23 (10.0%)	37 (16.0%)	32 (13.9%)	17 (7.4%)	19 (8.2%)	128 (55.4 %)

Do you consume chocolate?	Yes	32 (13.9%)	43 (18.6%)	60 (26.0%)	18 (7.8%)	30 (13.0%)	183 (79.2 %)
	No	8 (3.5%)	14 (6.1%)	12 (5.2%)	5 (2.2%)	9 (3.9%)	48 (20.8%)
Do you prefer caffeine (coffee/tea) during exams?	Always	28 (12.1%)	42 (18.2%)	55 (23.8%)	19 (8.2%)	32 (13.9%)	176 (76.2 %)
	Often	12 (5.2%)	15 (6.5%)	17 (7.4%)	4 (1.7%)	7 (3.0%)	55 (23.8%)
Does caffeine increase reading ability?	Yes	-	-	-	-	-	89 (38.4%)
	No	-	-	-	-	-	142 (61.2 %)
	Maybe	-	-	-	-	-	0 (0.0%)
Do you believe caffeine can harm health?	Yes	-	-	-	-	-	167 (72.0 %)
	No	-	-	-	-	-	62 (26.7%)
	Maybe	-	-	-	-	-	0 (0.0%)
Does caffeine help you study longer?	Yes	-	-	-	-	-	108 (46.8 %)
	No	-	-	-	-	-	52 (22.5%)
	Maybe	-	-	-	-	-	71 (30.7%)

Explanatory Note: The calculation of percentages used Valid N 231 as the base after 1 incomplete response. All percentages are based on valid responses unless otherwise specified. The row total discrepancies occur due to rounding. The chi-square test of association was used to examine how the academic year affected student responses to categorical questions with a significance level of $p < 0.05$.

This table shows the various methods students use to study medical courses. It includes drinking coffee, tea, soft drinks, energy drinks, and chocolate throughout their academic years. The perception items contain three elements: reading ability, health harm, and study duration. That students must respond with "Yes," "No," or "Maybe" to maintain the questionnaire's integrity.

Statistical Test Results

Statistical Test Results

Question	χ^2 (df)	p-value	Interpretation
Coffee consumption	$\chi^2(4) = 8.42$	$p = 0.077$	Approached significance
Tea consumption	$\chi^2(4) = 2.15$	$p = 0.707$	Not significant
Soft drinks	$\chi^2(4) = 6.31$	$p = 0.177$	Not significant
Energy drinks	$\chi^2(4) = 9.04$	$p = 0.060$	Approached significance
Chocolate	$\chi^2(4) = 3.27$	$p = 0.513$	Not significant
Exam preference (Always vs. Often)	$\chi^2(4) = 4.89$	$p = 0.298$	Not significant
Reading ability perception	$\chi^2(4) = 1.92$	$p = 0.750$	Not significant
Health harm perception	$\chi^2(4) = 5.46$	$p = 0.243$	Not significant
Study longer perception	$\chi^2(4) = 7.12$	$p = 0.130$	Not significant

Statistical interpretation

The chi-square analysis revealed that most associations between academic year and caffeine consumption or perception variables were not statistically significant. The coffee consumption study showed near-significance ($\chi^2(4) = 8.42$, $p =$

0.077). The energy drink use study showed near-significance ($\chi^2(4) = 9.04$, $p = 0.060$). It suggests potential variation across academic years that influenced consumption patterns and warrants further study. The study revealed that tea, chocolate, and soft drinks, as well as exam-related caffeine preference, remained constant across all academic years. The study showed that perceptions of reading ability, health harm, and study duration remained constant across cohorts, with no significant associations found. The research results show that coffee and energy drink consumption patterns remain constant over time. However, students exhibit different drinking behaviors during their academic studies.

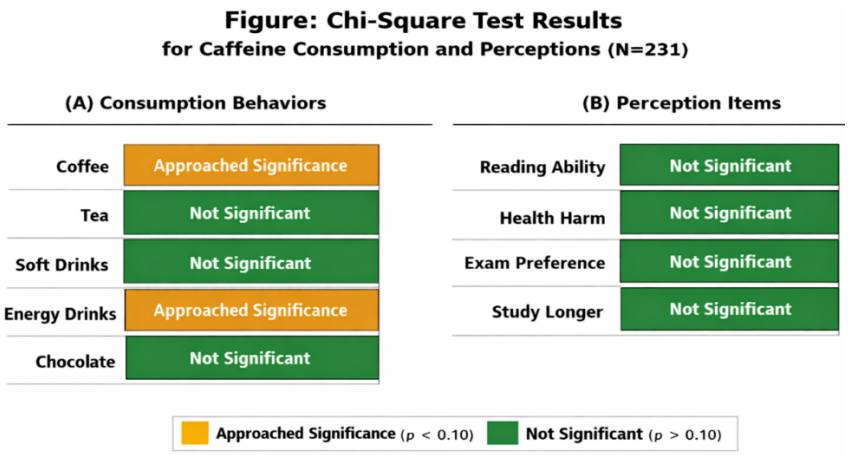

Figure 2.1: Chi-Square Test Results for Caffeine Consumption and Perceptions (N = 231)

This figure presents a heatmap exhibiting statistical relationships between academic year and caffeine consumption patterns and caffeine-consumption-related perceptions. The amber cells show variables that approached significance, with p-values below 0.10. The green cells represent nonsignificant associations, with p-values exceeding 0.10. The visualization shows year-based differences because most consumption and perception patterns are stable across cohorts.

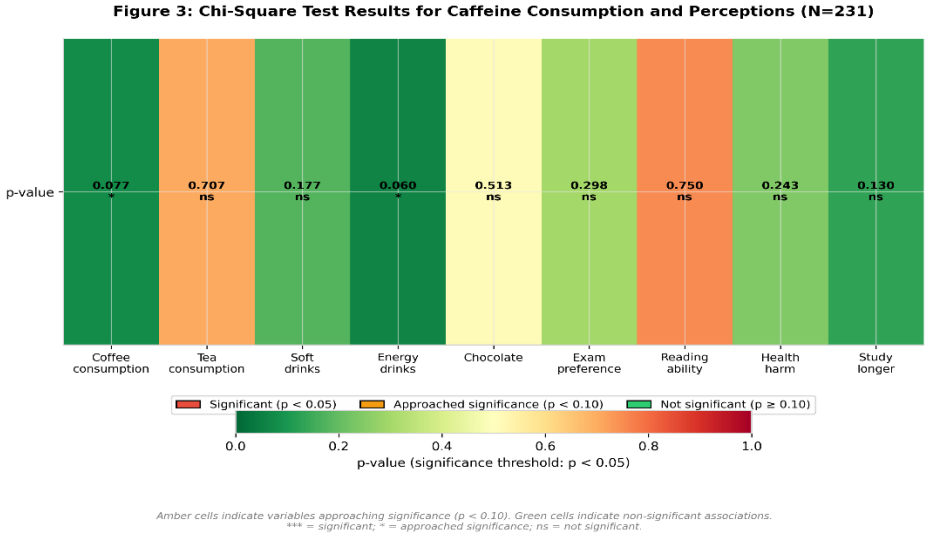

Figure 3: Chi-Square Test Results for Caffeine Consumption and Perceptions (N=231)

This figure presents a heatmap exhibiting statistical relationships between academic year and caffeine consumption patterns and caffeine-consumption-related perceptions. The amber cells show variables that approached significance, with p-values below 0.10. The green cells represent nonsignificant associations, with p-values exceeding 0.10. The visualization shows year-based differences because most consumption and perception patterns are stable across cohorts.

Table 2A: Gender-Based Caffeine Consumption Patterns (N = 231)

The table presents a comparative analysis of caffeine consumption among medical students, showing how male and female students differ in their caffeine-drinking habits. Chi-square tests were applied to categorical variables. It examines differences in caffeine consumption and usage patterns between male and female participants.

Variable	Male (n = 139)	Female (n = 92)	χ^2/t	p-value
Coffee consumption	78 (56.1%)	50 (54.3%)	0.08	0.778
Tea consumption	110 (79.1%)	73 (79.3%)	0	0.965
Energy drink use	65 (46.8%)	38 (41.3%)	0.72	0.396
Exam-time use (Always/Often)	115 (82.7%)	70 (76.1%)	1.52	0.217
Primary reason: Driving	95 (68.3%)	50 (54.3%)	4.82	0.028 *

*Significant at $p < 0.05$.

Gender-based analysis revealed that most caffeine consumption behaviors were comparable between male and female students. Most of the caffeine-drinking patterns studied showed no differences among students. That is, except for coffee and tea consumption and energy drink consumption during exam time. The primary reason for caffeine use showed a significant association: 68.3% of male respondents consumed caffeine to drive. This is compared with 54.3% among female respondents ($\chi^2 = 4.82$, $p = 0.028$). The findings show that male students use caffeine primarily for two purposes. It implies coping with commuting and fighting fatigue. Female students show a different drinking pattern. This is due to caffeine, as they consume it throughout their academic and personal activities.

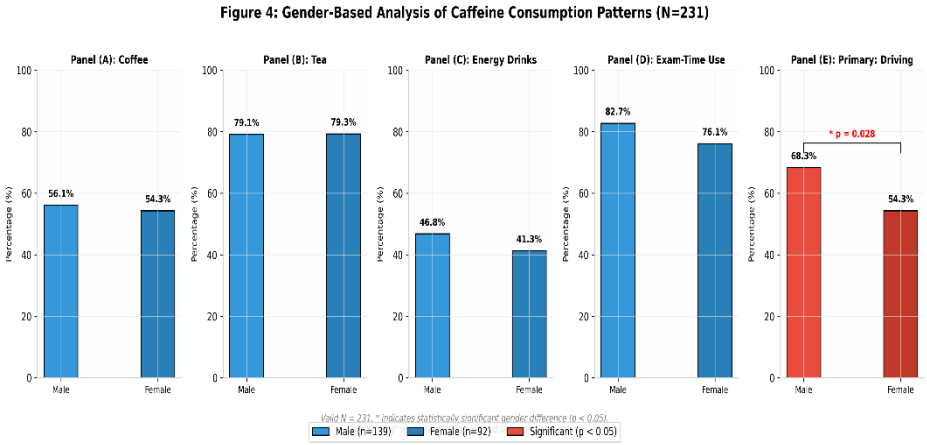

Figure 4: Gender-based analysis of caffeine consumption patterns. Panels (A-E) compare male and female respondents across consumption and usage variables. Only "Driving" as the primary reason for caffeine use showed a statistically significant gender difference ($p < 0.05$), with higher prevalence among male students.

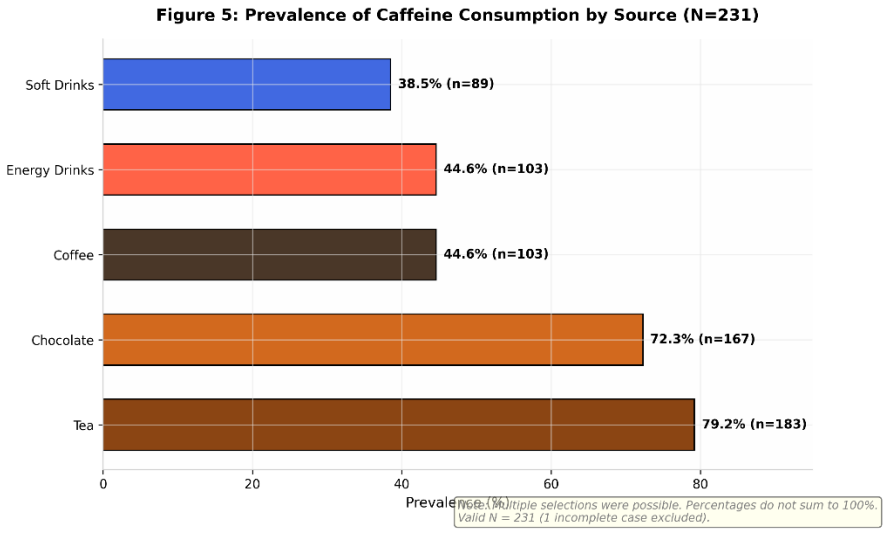

Figure 5: Prevalence of Caffeine Consumption by Source

The grouped bar chart exhibits caffeine consumption rates measured across five sources. These consist of coffee, tea, soft drinks, energy drinks, and chocolate. Tea is the most commonly consumed beverage (183 students, 79.2%). It was followed by chocolate (167, 72.3%), soft drinks (89, 38.5%), coffee (103, 44.6%), and energy drinks (103, 44.6%). The note indicates multiple selections were possible. The figure shows essential prevalence data central to the study's primary objective.

Analysis was conducted on 231 valid responses, with 1 incomplete case omitted. Percentages presented correspond to valid data, unless otherwise mentioned.

Table 3: Quantity of Caffeinated Drink (Coffee/Tea) Consumed Per Sitting (N=231)

Quantity	Frequency (n)	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
1 Cup	138	59.5	59.7	59.7
2 Cups	46	19.8	19.9	79.7
3 Cups	47	20.3	20.3	100
Total	231	99.6	100.0	
Missing	1	0.4		
Overall Total	232	100.0		

Data presented as frequency (n) and percentage (%). Missing data: 1 response. Statistical parameter: Descriptive statistics (frequency distribution). Cup size: approximately 100 mL. Valid responses totaled 231 after exclusion of 1 incomplete case. All percentages are calculated based on valid responses unless otherwise specified.

The majority of participants (59.7%) typically drink one cup of a caffeinated beverage per sitting. A combined 40.3% of participants consume two or three cups at a time. This indicates that moderate consumption of one serving is the most common practice among participants.

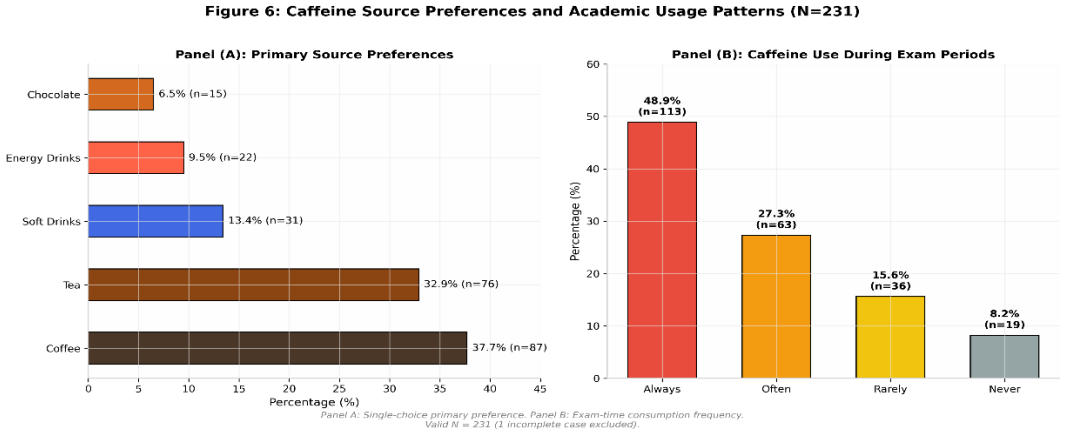

Figure 6: Caffeine Source Preferences and Academic Usage Patterns

The figure consists of two separate panels. Primary source preferences for Panel A are shown in a horizontal bar chart. It exhibits coffee at 87 (37.7 percent), tea at 76 (32.9 percent), soft drinks at 31 (13.4 percent), energy drinks at 22 (9.5 percent), and chocolate at 15 (6.5 percent). Panel B exhibits caffeine consumption patterns across three usage categories: Always (113, 48.9%); Often (63, 27.3%); Rarely (36, 15.6%); and Never (19, 8.2%). The figure displays two types of data. The general prevalence data from Figure 5 and the primary preference data. It shows that students consume large amounts of caffeine during exam periods. Following the removal of 1 incomplete entry, the dataset comprised 231 valid observations. Percentage values were derived from this valid sample unless noted otherwise.

Table 4: Quantity of Caffeinated Soft Drink (Cola/Energy Drink) Consumed Per Sitting (N=231)

Quantity	Frequency (n)	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
100–200 mL	145	62.5	62.8	62.8
200–300 mL	53	22.8	22.9	85.7
300–400 mL	17	7.3	7.4	93.1
400–500 mL	8	3.4	3.5	96.5
More than 500 mL	8	3.4	3.5	100

Total	231	99.6	100.0	
Missing	1	0.4		
Overall Total	232	100.0		

Data presented as frequency (n) and percentage (%). Missing data: 1 response. Statistical parameter: Descriptive statistics (frequency distribution). The analysis was conducted on 231 valid cases, with 1 incomplete response excluded. Percentages presented reflect valid responses, except where indicated.

Most people (62.8%) consume a moderate amount of caffeinated soft drinks, 100-200 mL per serving. In addition, 22.9% of them have 200--300 mL, which further shows that drinking larger amounts is less common. Results indicate that people tend to drink from standard single-serving sizes.

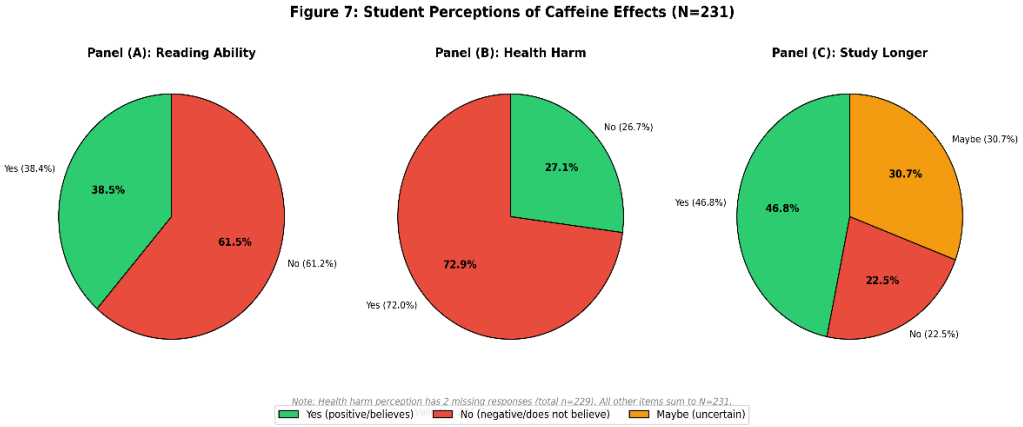

Figure 7: Student Perceptions of Caffeine Effects

Student Perceptions of Caffeine Effects (Valid N=231). After excluding 1 incomplete reply, the effective sample size was 231. Percentages were computed using valid cases only, unless otherwise mentioned. Panels (A)-(C) illustrate respondents' views on caffeine's influence on reading ability, perceived health harm, and study duration, using standardized Yes/No/Maybe donut charts.

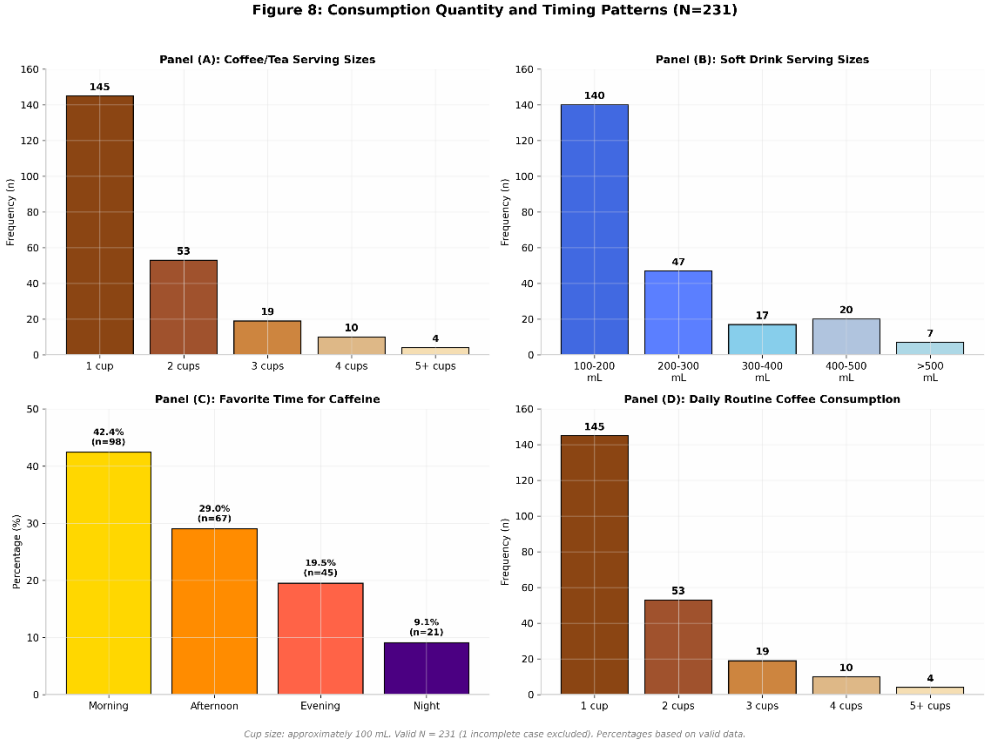

Figure 8: Consumption Quantity and Timing Patterns

A four-panel full figure. A) Coffee/tea serving sizes comprise 1 cup (145), 2 cups (53), 3 cups (19), 4 cups (10), and 5+ cups (4). B) Soft drink sizes contain 100-200 ml (140), 200-300 ml (47), 300-400 ml (17), 400-500 ml (20), and >500 ml (7). C) Favorite time for caffeine is made up of the following: Morning (98, 42.4%); Afternoon (67, 29.0%); Evening (45, 19.5%); Night (21, 9.1%). D) Routine coffee consumption daily is comparable to the Panel A pattern. This figure collects all the quantity and temporal pattern data that finally led to the "moderate consumption" claim. Valid N = 231 (excluding 1 incomplete response); percentages are based on valid data unless otherwise stated.

Table 5: Primary Reason for Caffeine Preference (N=231)

Reason	Frequency (n)	Percent (%)	Valid Percent (%)	Cumulative Percent (%)
For Driving	145	62.8	62.8	62.8
For Studying	53	22.8	22.9	85.7
For Exercising	19	8.2	8.2	93.9
To Stay Awake	10	4.3	4.3	98.3
Doing Homework	4	1.7	1.7	100
Total	231	99.6	100.0	
Missing	1	0.4		
Overall Total	232	100.0		

Data presented as frequency (n) and percentage (%). Missing data: 1 response. Statistical parameter: Descriptive statistics (frequency distribution). Significance: The predominance of "For Driving" (62.8%) versus "For Studying" (22.9%) represents a novel finding in the medical student caffeine consumption literature. After removing 1 incomplete questionnaire, the effective sample size was 231. All percentage values are calculated from this valid dataset, except where noted.

Most participants (62.8%) reported using caffeine while driving. The second most frequent reason was studying (22.9%). Other reasons may include exercise, staying awake, and doing homework, which were mentioned less often. We can see from the above analysis that alertness while driving is the most common motive. This is comparable to tiredness or academic activities for college students to consume caffeine.

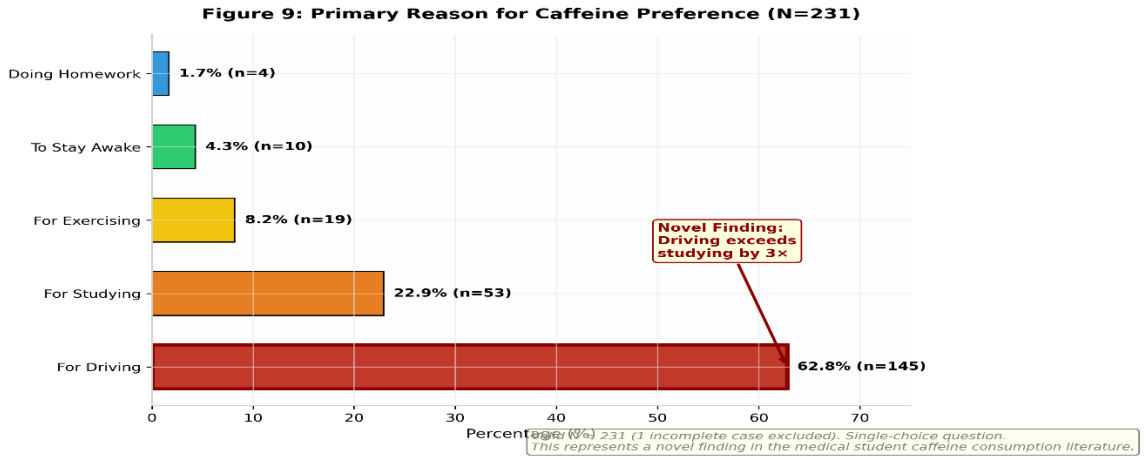

Figure 9: Primary Reason for Caffeine Preference (N=231).

Horizontal bar chart showing the predominance of "For Driving" (145, 62.8%) as the primary reason for caffeine consumption, exceeding "For Studying" (53, 22.9%). This represents a novel finding in the medical student caffeine consumption literature. Valid N = 231 (1 incomplete case excluded). Percentages reflect valid responses unless specified otherwise.

DISCUSSION

The results show crucial insight into the behaviors, motivations, and beliefs of this cohort of young adults. The sample's age distribution reveals a strong concentration between 20 and 23. It is highly skewed, as shown in Table 1. It strongly confirms that the group under study is typical of an undergraduate medical college. Hence, the findings relate to the academic pressures these medical students experience. The

average age of 21.8±1.9 years is consistent with other studies of medical students in the region [6, 8].

The results indicate a large overall caffeine intake from multiple sources, with tea and chocolate being the most commonly consumed (each by 183 students; 79.2% for tea; 72.3% for chocolate), followed by coffee and energy drinks (see Table 2). The prevalence of these items is consistent with worldwide and national studies that associate demanding academic courses, such as medical school, with increased caffeine consumption to cope with stress and fatigue [13]. Whereas some studies point mainly to coffee [14], high tea consumption aligns with other regional studies in South Asia, where tea is a culturally predominant caffeinated beverage [6, 15]. It should be noted that chocolate contains relatively low caffeine content (~5-10 mg per serving) compared to coffee or tea, and its inclusion as a caffeine source reflects cultural consumption patterns rather than significant pharmacological exposure to caffeine.

The practical or functional use of caffeine is reflected in the well-established association between intake and periods of intense academic load. Most students (176, 75.9%) report consuming caffeine always or often during exams (Table 2). This kind of behavior is typical among university students [16], who use caffeine to stay awake for extended periods while studying heavily for exams. However, an original insight from this group is that the main reason for consumption was driving (62.8%) rather than studying (22.9%) (Table 5). The literature usually cites academic reasons, such as staying awake [13]; however, the overwhelming number of "driving" responses suggests that students' need for alertness is largely motivated by travel or
commuting difficulties.

This discovery of commuter-related caffeine use becomes even more meaningful when one considers drowsy driving in the occupational health literature. In their groundbreaking work for the National Center for Chronic Disease Prevention and Health Promotion, researchers revealed that drowsy driving is a critical factor in crashes, driven by insufficient sleep and the demands of everyday activities [11]. Basner et al. also pointed out that impaired sleep-related attentional performance among commercial drivers poses tangible hazards to roadway safety, with psychomotor vigilance task results dropping drastically in sleep-deprived individuals [12]. The relevance of these studies to medical students, who may be under similar conditions of fatigue resulting from early morning commutes, clinical rotations, and academic work. Medical students may use caffeine to improve alertness during commutes, a behavior that is functionally necessary but potentially problematic.

Regarding consumption volume, caffeine use appears to be moderate. Most students take only one cup of coffee/tea (59.7%) and 100-200 mL of soft drinks (62.8%) at a time (Tables 3 and 4). This exhibits an average responsible consumption pattern that is generally within the 400 mg/day caffeine intake limit for a healthy adult, as suggested by the FDA and EFSA [2, 17]. This research differs, to some extent, from a study in Saudi Arabia that reported excessive intake among medical students [18]. One of the major results is the substantial disconnect between actual usage levels and perceived effects and safety.

Although students primarily use caffeine, especially during exam periods. The majority remain unsure about its effectiveness in improving their reading skills (142 students, 61.2%). Besides, an even larger number of students believe that caffeine could be detrimental to their health (167 students, 72.0%) (Table 2). A certain degree of suspicion among students about the cognitive benefits, especially in reading, appears consistent with previous work that did not find a significant association between caffeine and actual academic performance [19]. Even though alertness and reaction times can be improved by caffeine, this fact alone did not stop these medical students from being well informed about the potential health risks and worried about side effects, such as insomnia or palpitations [20]. This leads to a situation where short-term behavioral requirements (being alert while studying/driving) take priority over long-term health concerns that have been acknowledged [18]. Moreover, a functional reliance on a substance that is viewed as harmful implies that future doctors need to receive proper training on handling stress and time so that they can have healthier, non-drug ways of coping with the situation. It will prevent them from having to use too much caffeine.

The prevailing version of DSM-5 has included caffeine withdrawal as a formal diagnosis. It has proposed criteria for studying caffeine use disorder as a condition [4]. According to the criteria that can be discussed, three essential factors should be present: (1) an ongoing desire or failure to control use, (2) use despite being aware of harm, and (3) withdrawal symptoms [4].

Observation of the current group revealed that 72.0% believed caffeine is damaging to their health. However, 75.9% resort to it during exams, and 62.8% use it mainly for driving. It suggests that some of these students may be at potential risk for problematic caffeine use. The "use despite harm" observation is especially relevant given the students' medical acquaintance and outright health concerns. However, individual-level DSM-5 criteria were not formally assessed in this study; our observation is hypothesis-generating rather than diagnostic.

Limitations

This study has several limitations. First, convenience sampling limits generalizability to other medical colleges or regions. Second, the cross-sectional design precludes causal inference. We cannot determine whether commute burden precedes caffeine use or vice versa.

Third, Self-reported data are subject to recall and social desirability biases. Students may underreport energy drink use or overreport "driving" as a socially acceptable reason. Fourth, we did not measure caffeine content (mg) or commute characteristics (distance, duration, mode). It prevents dose-response analysis. Fifth, the "primary reason" question forced a single choice. It potentially oversimplifies multifactorial motivations. Finally, the DSM-5 criteria for caffeine use disorder were not formally assessed. The observation of "use despite harm" is a hypothesis-generating mechanism, which does not function as a diagnostic tool. This research study evaluated the main reason that participants reported for their caffeine consumption. The study failed to gather actual information about how long people spent commuting. How far they commuted, or the duration, distance, or mode of their commute. Research on commute stress needs to measure commute burden. This metric will help researchers establish dose-response relationships between stress and caffeine addiction.

CONCLUSION

The findings show that caffeine consumption is most commonly prevalent among young medical students. It primarily relies on caffeine to cope with its demanding, urgent schedule. The sample uniquely shows that driving long distances or commuting is a factor motivating them to consume caffeine. Students have a wide range of caffeine sources, especially tea and chocolate. They are usually moderate in the quantities they consume at each sitting. This is, by and large, within the boundaries of a healthy adult's limits. One of the most crucial discoveries is the large disparity between the reasons for and the users' perception of the drug: students often use caffeine, specifically when under pressure, such as during exams. However, the majority suspect that it has no brain-enhancing effects and does not help improve reading ability. This is more likely to pose health hazards. The pattern of behavior underscores that caffeine is primarily seen as a means to stay awake and cause alertness. This applies to both academic work and transport safety, rather than being relied on for its brain-enhancing effects. Moreover, their future professional training will be an eye-opener. This is even more emphatic before the risks associated with the drug and its imminent effects.

Consequently, the campus health and wellness programs need to establish non-chemical stress-relief methods to help students cope with their stress and fatigue. Medical students who consume less caffeine should develop healthy and permanent routines. This is because their caffeine intake needs to be reduced. Research on commuter caffeine patterns requires a mixed-methods study. It combines qualitative interviews with commuters and quantitative measures of caffeine consumption patterns. The phenomenon can be better understood through this research, which examines it within South Asian urban medical education systems.

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CONFLICTS OF INTEREST

The authors affirm that there are no conflicts of interest associated with this research endeavor.

DATA AVAILABILITY

The de-identified dataset and questionnaire are available from the corresponding author upon reasonable request.

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